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H.-B. DE SAUSSURE : JAMES HUTTON'S OBSESSION

BY

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(Ms. reçu le 28 mars 2000, accepté le 7 juin 2000)

ABSTRACT

H.-B. de Saussure : James Hutton's obsession. – James Hutton's last *Theory of the Earth* (1795) has the unusual feature of being bilingual, with at least one fourth of its two volumes (1187 pages) in quoted French. Hutton had chosen these citations from the works of H.-B. de Saussure and other French-speaking naturalists. His previous Theory of 1788, mainly based on his own geological observations in Scotland, and thus lacking the knowledge of other European areas, had been harshly criticized as being regional in scope instead of universal. Hutton was therefore anxious to analyze other geological settings described in published works, in particular the Alps, which had recently become famous by Saussure's *Voyages dans les Alpes...* (1779, 1786). Hutton, although using Saussure as his most reliable source, was actually quoting facts and interpretations by a Neptunistic geologist to document his new Plutonistic theory. This provided a most challenging comparison between two diametrically opposed points of view, as well as some insight into Hutton's almost obsessive wish to interpret geological facts without having seen them. This important contribution to the history of geology has remained little known because of the language barrier. It is presented in this work for the first time together with the English translation of Saussure's quoted text.

Key-words : Neptunism, Plutonism, theory of the earth, granite, Alps, Mont-Blanc, Monte-Rosa, Salève.

RÉSUMÉ

La dernière *Theory of the Earth* (1795) de James Hutton possède le caractère inhabituel d'être bilingue avec au moins un quart de ses deux volumes (1187 pages) représenté par de longues citations en français provenant des travaux de H.-B. de Saussure et d'autres naturalistes francophones. Sa théorie précédente de 1788, basée principalement sur ses propres observations en Ecosse, et ne tenant pas compte des connaissances d'autres régions européennes, avait été fortement critiquée comme étant de nature régionale et non pas globale. Par conséquent, Hutton était très anxieux d'analyser, par personne interposée, d'autres situations géologiques, en particulier les Alpes récemment devenues fameuses à la suite des *Voyages dans les Alpes...*(1779, 1786) de Saussure. Hutton, tout en considérant de Saussure comme sa source la plus

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fiable, se trouvait ainsi dans la situation d'utiliser les faits et les interprétations d'un géologue neptuniste pour démontrer sa nouvelle théorie plutoniste. Cette situation donne lieu à une comparaison provocatrice entre deux points de vue diamétralement opposés et à un aperçu sur l'obsession de Hutton d'interpréter des faits géologiques sans les avoir vus lui-même. La barrière linguistique a fait que cette importante comparaison pour l'histoire de la géologie est restée peu connue. Elle est présentée dans ce travail pour la première fois avec la traduction en anglais des citations du texte de Saussure.

Mots-clés: Neptunisme, Plutonisme, théorie de la terre, granite, Alpes, Mont-Blanc, Monte-Rosa, Salève.

INTRODUCTION

This paper presents a comparative study of the geological works by James Hutton and Horace-Bénédict de Saussure. I found that, with the exception of Playfair (1802), the two naturalists have never been compared before. The reason for this might be that few historians of geology have actually read all of Hutton's last work (1795). Indeed, the lengthy descriptions and citations in French of works by Saussure and other European naturalists may have discouraged many a reader. For example, Vol. I of 620 pages, has about 80 pages of citations; Vol. II. of 567 pages, has 277, and Vol. III of 267 pages, has 41. These facts alone can easily cause a language barrier. In fact, many historians of today prefer to peruse Playfair's *Illustrations...* or Hutton's earlier and shorter *Theory of the Earth...* (1788).

Since Hutton repeatedly mentioned Saussure as his most reliable source, this paper will give a translation of all French citations from Saussure's first two volumes in Hutton's Vol. I and II (1795), as well as from his manuscripts, published under the title of Vol. III (Geikie, ed., 1899; Dean, ed., 1997), thus trying to lift at least some of the difficulties for the modern reader in his understanding of Hutton's last works.

During these translations, I found, unsuspectedly, the ideas of the two geologists side by side, thus providing a most challenging insight into the different ways of interpreting facts by Hutton and Saussure. Their ideas are indeed very often diametrically opposed and therefore all the more interesting for this comparison.

Methods and techniques

I translated into English Saussure's French texts cited by Hutton in his last *Theory of the Earth* (1795) and in Volume III, after careful comparison with Saussure's original French text in *Voyages dans les Alpes...* Vols. I and II, (1779, 1786). Small typos in Hutton's French were corrected without mentioning them whereas critical errors were referred to in the translation within square brackets. Ellipses were used before or after Hutton's citations if the beginning or the end of a paragraph, or several paragraphs by Saussure, are missing. To distinguish Hutton's words from those of Saussure, the translation of Saussure is *left-indented* and includes, if necessary, explanations by the

translator in square brackets. French expressions or spelling of localities, rivers, and mountains, mostly modernized, are in italics. The following abbreviations were used: for Hutton's vols. I and II for example: [H. I. 333] and for Saussure's translated text [S. I. §. 100, p. or pp....]. Saussure's paragraphs were given before the pages of the edition in 4° because an edition in 8° of *Voyages...* exists with different pagination but same paragraph numbering. References to Hutton are always given at the beginning of the citation, while short references to Saussure are at the end of the citation. If the latter are long, they are, if possible, placed at the beginning too.

VOLUME I

This volume explains mostly Hutton's own ideas with fewer references to Saussure than in vols. II and III. Struggling to explain consolidation of strata, Hutton first refers to Saussure's ideas on the marine origin of calcareous bodies and then to processes of crystallization.

On crystallization processes in limestones

In Vol. I. Hutton points out [H. I. 23-24] that

"There are few beds of marble or limestone, in which may not be found some of those objects which indicate the marine origin of the mass. If, for example, in a mass of marble, taken from a quarry upon the top of the Alps or Andes*, there shall be found one cockle-shell, or piece of coral, it must be concluded, that this bed of stone had been originally formed at the bottom of the sea..."

He cites Saussure's text in a footnote *:

* "This summit [to the east of the Lake of Flaine, on a mountain called *le haut de Veron*, or *la Croix de Fer*] reaching 984 toises above our lake [Lake Geneva], and therefore 1172 toises above sea level, is noteworthy because it shows fragments of petrified oysters....This mountain is dominated by a steep rocky cliff which, though not inaccessible, is nevertheless very difficult to climb. It seems to consist almost entirely of petrified shells enclosed in a limestone or coarse blackish marble. The fragments which become loose, and are found at the *Croix de Fer*, are filled with *turbinites* of different species." [S. I. §. 469, pp. 393-394].

Hutton concludes: [H. I. 24]

"We thus shall find the greatest part of the calcareous masses upon this globe to have originated from marine calcareous bodies..." He adds:

"In those calcareous strata which are evidently of marine origin, there are many parts that are of sparry structure, that is to say, the original texture of those beds, in such [H. I. 25] places, has been dissolved, and a new structure has been assumed, which is peculiar to a certain state of the calcareous earth. This change is produced by crystallization, in consequence of a previous state of fluidity... A body, whose external